

THE
NATURE & TREATMENT
OF THE
EPIDEMIC CHOLERA.

By ROBERT VENABLES, A.M. :

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Whittlesea, Isle of Ely, Cambridgeshire ; and Physician to the temporary
Cholera Hospital, Wick, Caithness, North Britain.*

“Disce, docendus adhuc quæ censet amicus ; ut si
Cæcus iter monstrare velit : tamen adspice, si quid
Et nos, quod cures proprium fecisse, loquamur.”

Hor. Epist. lib. I. Ep. xvii.

Wick :

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1832.

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TO
THE GOVERNOR,
THE DEPUTY-GOVERNOR,

AND
DIRECTORS,

OF THE
BRITISH SOCIETY FOR EXTENDING THE FISHERIES, AND
IMPROVING THE SEA COASTS OF THIS KINGDOM:

TO THE
PRESIDENT AND MEMBERS

OF THE
LOCAL BOARD OF HEALTH;

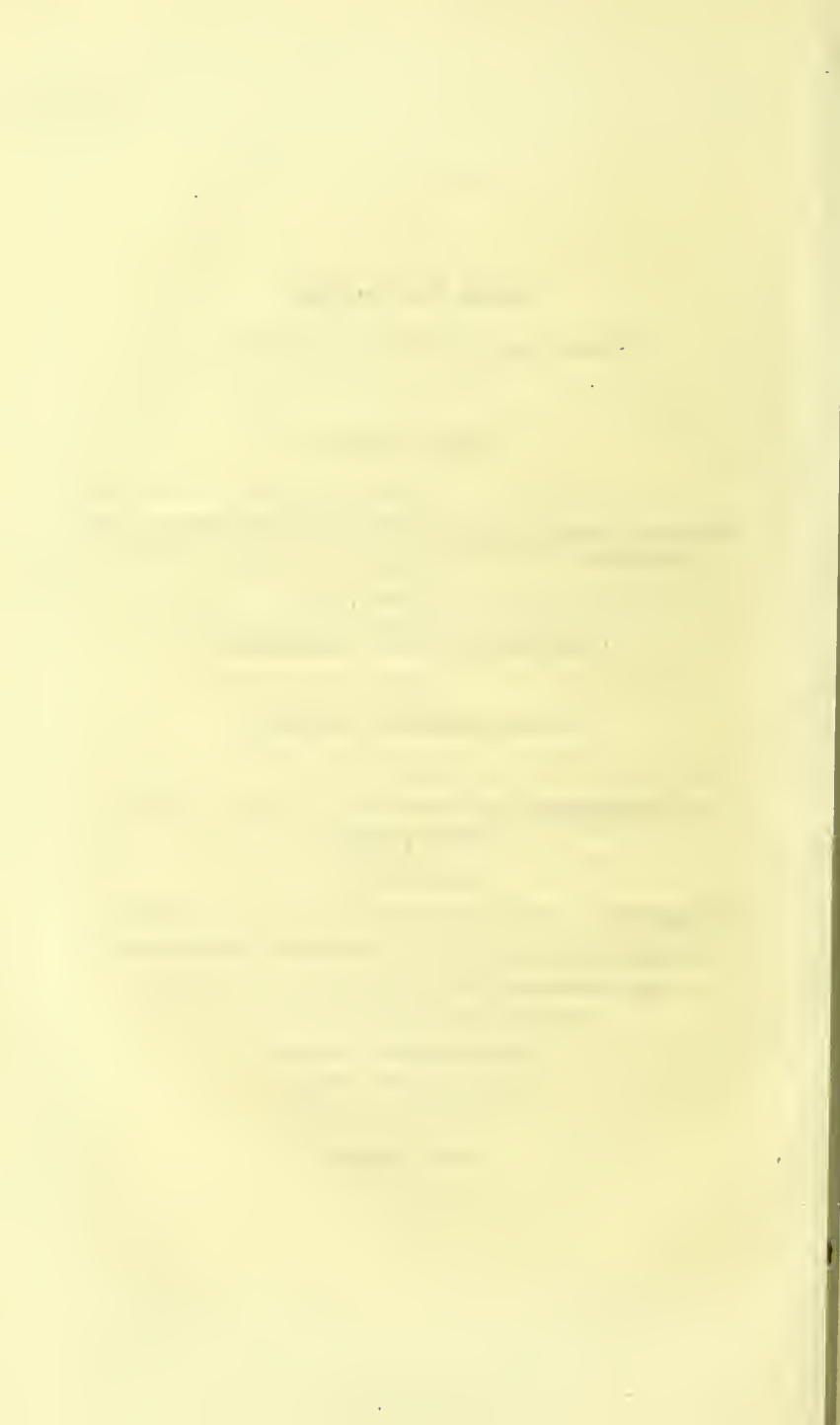
AND TO
THE INHABITANTS OF THE PARISH OF WICK AND PUL-
TENEYTOWN:

THIS ATTEMPT :

To Explain the “Nature and Treatment of the Epidemic Cholera,”
arranged and composed during the performance of those profes-
sional duties which they did him the honor to entrust
to his management and superintendence :

Is most respectfully inscribed,
By their faithful, obliged,
And obedient Servant,

THE AUTHOR.



TO WM. PYM, M.D. KNT., *Chairman,*

AND

SIR DAVID BARRY, M.D., KNT., *Deputy-Chairman, &c. &c. &c.*

Central Board of Health, London.



GENTLEMEN,

IN addressing to you this attempt to investigate the nature and treatment of Epidemic Cholera, I am far from wishing to affix a fictitious value by prefixing to it names which stand so high in the records of professional reputation in this country. It might possibly be supposed, that by addressing this little Essay to individuals, who have so effectually and so justly acquired the confidence of Government, and procured for themselves, under the most trying circumstances, and in the execution of a most delicate and important duty, the respect and esteem of the great body of the British Nation, I was anxious, under the appearance of such high sanction and authority, to obtain for it a greater share of attention than its merits entitle it to. However, I at once disclaim all such motives, and am desirous that its claims should rest entirely upon its own intrinsic value. There are none, however, in the whole circle of our profession more highly qualified or more competent than yourselves, to decide upon the merits of a work like that which I now submit to you. This is but a natural consequence of the official duties which the Government have entrusted to your direction. Placed in a confidential situation, which necessarily brings under your review, the collective efforts of the entire body of our Profession throughout the British Empire; and which also affords you access to the professional labours of Foreign Nations, upon the subject in question; whom, in the whole range of our Professional public, could I have selected more capable than yourselves of determining the value of the views and principles here laid down; or whether they be deductions consistent with the phenomena of the disease, its morbid anatomy and pathology; or, in short, more competent to decide whether this little Essay shall stand or fall. I shall now briefly address myself to the nature and plan of the following attempt.

In order to establish a uniform system of reporting cases, it was necessary to determine the phenomena, which should justify entering a case as one of Cholera in the daily reports. On my arrival at Wick, on the 7th of August last, the population of this Parish amounted to nearly 30,000. More than a third, perhaps nearly a half, consisted of strangers from all parts of Scotland and Ireland, engaged in the Herring Fishery. The population was crowded to excess, and densely impacted, and of course great apprehen-

sions were entertained of the ravages and havoc which would attend any irruption of Cholera. The safety and trade of the place depended upon restoring confidence among the fishermen, and inducing them to remain faithful to their engagements, instead of returning home from a dread of the impending pestilence. I therefore established a principle of reporting no case, which did not unequivocally manifest what I have represented as the symptoms characterizing the premonitory stage. Although by omitting the severe forms of diarrhœa, we increase our average mortality, yet I believe that such a daily accession of cases as the preliminary diarrhœa, or "the dysentery," as it is here called, would have ruined the place, by crippling the herring fishing, and thus destroying its trade. Therefore of the cases (306) reported by myself and colleague to the Local Board of Health, there was not a single one of them but had at least the premonitory stage clearly, characteristically, and unequivocally marked.

The division into the cold and the collapsed stages may possibly to some appear more fanciful than real or useful. However, I think if they be really merely but degrees of one and the same stage, yet the division will prove practically useful, by directing the attention to what period of the stage is, and what period is not, curable.

In describing the typhoid stage, I have endeavoured to place in a conspicuous point of view, those symptoms which usually precede and give notice of the approach of death. The Practitioner should watch for them, because they may be successfully combated at an early period; whereas, perhaps, no treatment will succeed when morbid organic vascularity has set in.

With respect to the causes, it was unnecessary to be diffuse, after the full consideration given to contagion in my paper published in the Cholera Gazette.

Under the heads Diagnosis and Prognosis, I have offered some observations upon Hiccup. I think experience will attest their correctness.

I think the mode of death and convalescence a subject of considerable interest, and I have given it all the consideration which the very many and important claims upon my time and attention would permit.

With respect to the treatment: what has been advanced upon the subject is not the mere dictum of theory, but the result of ample experience, and its success is attested not only by the observation of those who had witnessed other modes, but confirmed by their adoption of it in their own practice. I have but two observations to make upon the treatment—namely, that I consider the advantage of the salt emetic, hinted at in the foot note of page 36, confirmed by additional experience. The other observation refers to the treatment of the typhoid stage, or more correctly its management. I consider the transfer of the febrile cases to the Marquee, one of the greatest improvements in the treatment of the disease, which it has occurred to me

to witness. The Marquee has been now upwards of five weeks in operation, and although the cases have shewn the same decided characters of malignancy till the establishment of febrile reaction; yet this stage has been so far modified, that in many instances the reaction hardly deserved the name of fever; and in no case has it assumed a severity beyond that of ordinary simple continued fever. This I attribute entirely to the more perfect ventilation attainable in a Marquee. The temperature, too, can be regulated at pleasure, by means of the hot air stove, and the walls of the Marquee.

I am also particularly anxious to call your attention to the two species of Morbid Vascularity, described in the section on the Morbid Anatomy and Pathology, and also to the mode of treating them by mercury and diaphoretics. I am satisfied that our views of mercury, as an anti-inflammatory agent, are erroneous, and often lead to considerable mischief. Its chief use is in what is termed hepatitis, but I believe in real inflammation of the liver, it proves more than inert—it proves hurtful. We do not often, however, meet with real acute hepatitis—it is veno-congestive inflammation, a species of morbid vascularity, to which its vascular structure greatly disposes, and in which mercury is eminently serviceable.

The management of the adventitious symptoms, not essentially constituents of the disease, is a subject not to be overlooked,—as if neglected, they prolong the duration of the complaint, or often cause a relapse. The Prophylactics, though concise, perhaps comprise some useful general matter.

The success of the treatment at Wick has been a subject of considerable discussion; great speculation, and some slight degree of mistrust. Some account for the average success, by asserting that the bilious diarrhœas are included in the Daily Numerical Reports as Cholera. The body of the work is a sufficient refutation of the assertion. Others believe that the deaths are suppressed. Let the Local Board of Health and the inhabitants generally, decide whether this be a well founded imputation. But the real plan of estimating, is to make no comparison between the cases, and the deaths and recoveries; but to take the abstract mortality as the standard of comparison. The population of this district was about 25 or 30,000 on my arrival, and has fluctuated from between 15 to 20,000 ever since. The mortality from Cholera then in this population since the 7th August to the present period, has been exactly 66 deaths. But it may be said the disease has been of a milder character. This no doubt is true, but what has rendered it so? No doubt the management. Had we thrown in, or sanctioned the wholesale ingestion of brandy and ardent spirits,* there can be little

* *The Board of Health have not furnished half a gallon of brandy for the internal use of all the patients in the parish of Wick. The principal consumption has been in one or two warm baths, in which it seemed wholly useless, and to the servants employed about the Hospital, when engaged in the performance of very disagreeable duties.*

doubt the disease would have been malignant enough, and our mortality would have cut a very conspicuous figure, and have occupied a very prominent place in the fatal records of the day. If, then, by avoiding what is pernicious, and by prescribing only what is useful and salutary, we have been enabled to disarm the disease, and rob it of its virulence, what more can the utmost professional ambition require. To say that the disease would not, or does not *cœt. par.* assume the same degree of malignancy in one place as another, is the very height of absurdity. That the mortality has been limited, and kept far below what even my own most anxious and sanguine expectations could have anticipated, is now a source of self-congratulation, and of the most sincere gratification to us all. I therefore felt it a duty—an imperative duty—to place the whole history of our proceedings before the public, and to address them to persons so well qualified to decide.

Some fault may be found with the popular form of some of the prescriptions, as unsuited to a professional work: it was unavoidable however, from causes to which it is unnecessary more particularly to advert.

Although I send this work before the public, willing that it be judged by its own claims—yet there is no one more sensible of its imperfections, than myself. Indeed, the perfect arrangement of so intricate, complicated, and as yet but little understood subject, would require energies and talents far beyond any I can boast; but arranged as this has been, during a period of great public excitement, anxiety, and fearful apprehensions—with almost unceasing demands upon my time and intrusions upon my privacy and the moments devoted to reflection—I am more surprised that it should have been completed at all, than that it should be found abounding in errors and imperfections. Under these circumstances, I feel that ample apologies are due to you, for addressing to you an attempt of the many imperfections of which I am fully conscious. But the uniform kindness I have experienced at your hands, convinces me that you will make all due allowances, and that you will not examine too closely, nor pronounce too harshly, upon such imperfections, as do not amount to radical faults. Such, however, as it is, I beg you will accept it, as an assurance of the respect and esteem in which you are held by,

GENTLEMEN,

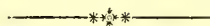
Your very faithful, obedient, and grateful,

Friend and Servant,

ROBERT VENABLES.

Wick, 29th September, 1832,

THE NATURE AND TREATMENT, &c.



THE progress of Cholera may be divided into the *preliminary diarrhœa* ; 2d, The *premonitory* ; 3d, The *cold* ; 4th, The *collapsed stage* ; and 5th, The *stage of typhoid reaction*. The *preliminary diarrhœa* consists in the passing off of the biliary and feculent matters from the intestines. The duration of this stage varies from one to ten days. Its continuance, however, is, generally speaking, determined by the violence of the purging. When the stools amount to only three or four in an hour, or perhaps six or eight in the twenty-four hours, the premonitory stage is proportionally deferred. I am not aware of any thing in the character of the diarrhœa, which will enable us to determine whether it be the preliminary to an attack of Cholera, or diarrhœa from more ordinary causes. The history of the case will probably furnish the best grounds for deciding this question. There is one circumstance, however, which, when it occurs, may be invariably looked upon as determining the nature of the diarrhœa—namely, the frequency of the motions: for instance, when the purging is repeated twenty or thirty times in an hour. When this is the case, a severe attack of Cholera may be anticipated, unless sanative measures be resorted to.

The *premonitory stage*, I regard as decisive of the system being under the influence of the causes of Cholera. This stage is characterized by the watery, serous, or mucous character of the alvine discharges. It is truly a serous or mucous diarrhœa, or perhaps both. The intestinal discharges are almost invariably alkaline. I have examined them in numerous instances, and cannot bring to my recollection a single occasion on which I found this character wanting. When the premonitory manifestations are once fully established, there is neither bile nor feculent matter to be detected in the discharges, by any of the usual chemical reagencies. Indeed, I believe that the bile and fœcal matters are discharged, or pass off, during the preliminary stage; while in the premonitory, the serum of the blood is poured into the canal, and is passed off from the intestines. There is seldom or never vomiting in either of the above stages; but a severe degree of nausea, or even retching, frequently attend these stages, more particularly the latter.—Spasms of the abdominal muscles, with severe griping, frequently prevail during these stages; more particularly during the latter; and the severity of the spasms and griping are greatly increased should flatulence be a concomitant. The tongue generally feels cold in this stage.

The third stage I denominate the *cold stage*. Some, perhaps, may be inclined to look upon it as but a less severe form of collapse. Be this as it may, I have found it practically useful to distinguish it, and note its characters. In this stage, there is vomiting and purging of serous, or muco-serous matters. The abdominal spasms increase in severity, and the cramps in the extremities are intolerable. The temperature of the body is very much reduced below the healthy standard, and the

tongue feels moist and extremely cold, but is still clean. The pulse is feeble and weak, but perfectly sensible to the feel. A cold clammy sweat frequently bedews the surface. There is an anxious desponding expression of countenance—the features are so much altered, that it is difficult to recognize those with whom we have been but slightly acquainted during their health. There is often a lividity of the toes and fingers; the skin becomes shrivelled; the eyes sink into the orbits; there is an expression of languor and despair, and they assume somewhat of a glassy appearance; while the face appears elongated and sharpened, from the absorption of the adipose substance. There is a total suppression of urine in this stage; and, in one or two instances, I have witnessed considerable irritation in the bladder, manifested by an urgent desire to void the urine; while the introduction of the catheter proves that the bladder is empty. This I observed more frequently in women than in men; but altogether it is rather of rare occurrence—being more frequently a concomitant of the febrile stage.—Recovery is frequent from this stage; and singultus at this period promises a speedy convalescence.

The fourth stage may be called the *collapse*. In this stage the vomiting and purging cease altogether, or they are but very trifling. Whatever discharge takes place from the bowels is involuntary, and the patient does not appear to be very sensible. Indeed they take no notice unless roused; but still when they can be roused, the faculties seem to be unimpaired. More frequently, however, there is a general torpor, particularly towards the advanced periods of the collapse. The respiration becomes laborious, and even stertorous;—the whole of the body assumes a livid, purple, black, or blue hue;—the

patient becomes deadly cold, and nearly senseless ;—the eyelids are but half closed, while the globe of the eye is reverted, so that the pupil is drawn up under the orbital process of the frontal bone ;—the pulse is not to be felt at the wrist, nor are even the carotid or femoral pulsations to be perceived. Indeed, the motions of the heart, if they exist at all, are so weak and feeble, that they are frequently not perceptible even to stethoscopic exploration. The respiration becomes gradually slower and slower, and the intervals between each succeeding inspiration are often so prolonged, that the patient is considered as dead, until a subsequent deep sob convinces the bystanders that the unhappy victim had not positively ceased to exist. At last, however, a long deep convulsive sob puts a period to his existence. Recovery, under these circumstances, or indeed from this stage at all, is very rare, and can hardly be looked for: still, I must state, that I have witnessed three recoveries in this Hospital, under circumstances as hopeless as any in the above description.

The fifth stage, or that of *febrile reaction*. There is often a transition, from the cold stage to one of fever, assuming the typhoid character. It often happens that there is a transition from the premonitory to the typhoid stage, without the intervention of either the cold or the collapsed stage. The typhoid stage appears by a gradual diffusion of warmth over the entire surface; the tongue gets dry and glossy; and in persons whose digestion is impaired, or in whom the alimentary organs are irritable or congested, the tongue assumes a dull reddish appearance, something like that of dried salmon. The thirst, which was insatiable in both the premonitory and the cold stage, but which disappears in

collapse, reappears during the febrile stage. The thirst, however, at this period is not so urgent, as it was during the premonitory and the cold stages. The respiration is quickened; the pulse becomes perceptible, and more frequent. It is always small, but often hard and thready. Sometimes it is softer and slower: whenever there is a transition to the febrile stage, there is always a dull languid expression of the eye, and it is invariably more or less suffused. The degree of suffusion is one of the most unerring means of prognosis with which I am acquainted. The moment febrile reaction takes place, I watch the appearance of the eye with the most scrupulous attention; for if suffusion to any extent or degree of severity set in, I look upon the case as lost. A fatal congestion in the brain is the result; and although I have seen one or two recoveries in this Hospital, under the circumstances above described, and as unpromising as it is well possible to imagine; yet I am not inclined at present to set a high value upon the remedial means adopted, notwithstanding the success which attended the activity and decision with which they were employed. It still remains a doubt in my mind, whether the recovery was not owing as much to chance as to the curative means instituted, however powerful, or well devised they may seem. However, as they will be detailed in a future part of this treatise, the public will have an opportunity of forming their own judgment on the subject.

During the febrile stage, there is often vomiting and slight diarrhœa. Sometimes diarrhœa alone—sometimes vomiting alone. Sometimes there is merely nausea, or nausea with retching. The evacuations in these cases seem to consist of the water or fluids which the patient drinks, tinged with bile. They are frequently of a green

colour, owing, apparently, to some acidulous reaction on the bile;—the discharged fluids, in such circumstances, commonly giving a slight tinge of red to litmus paper. There is often headach, or a sense of weight in the back part of the head, or across the fore-head; or there is a soreness of the proecordia, very sensible on slight pressure. The urine—if the patient is likely to do well—is generally secreted; but in unfavourable cases, there is an urgent desire to pass water, though, on examination, there is none found in the bladder. More often, however, the urine is secreted, and voided. This promises well. Where there is much congestion in the brain, the urine is frequently secreted, but retained in the bladder, producing a considerable degree of tumefaction in the hypogastrium. This is a fatal symptom. I saw three instances of this at Whittlesea, and two in this Hospital. In one of the cases at Whittlesea, a woman of the name of Cox, the accumulation was so rapid and so great, that in one night the abdomen swelled so much, that it felt as if she was pregnant. I immediately sent notice to Mr Boulton, Surgeon, who drew off a considerable quantity of urine. When death takes place in this stage, the patient mostly dies comatose,—sometimes with slight convulsions. Such appears to me a faithful picture of the disease. The above history, though concise, yet will, I believe, be found to comprise the leading phenomena. The description has been furnished to me by much patient, but painful and laborious observation; and I think it will be borne out and confirmed by those who have had much opportunity of experience.

ON THE TRANSITIONS FROM THE ANTECEDING INTO THE
CONSECUTIVE STAGES.

IT almost invariably happens, that attacks of Cholera are preceded by diarrhœa, of greater or less severity. There are some few instances in which no such symptom could be clearly traced; but in the great bulk of cases, it was found upon inquiry, that a "looseness" of the bowels, of more or less intensity, had ushered in the disease. The character of the discharges was always bilious and feculent; and it was the constant observation of this fact that determined me to regard it as a distinct stage. The transition from this stage is sometimes quite sudden and abrupt. Thus I have been frequently called to persons who had been labouring under diarrhœa—or as it is more usually expressed in the North of Scotland, "the dysentery"—for many days without any apprehension, but who suddenly became alarmed, because the discharges assumed the appearance of pure water, whey, or gruel. Such had always the alkaline reaction to a greater or less extent. In other cases, the diarrhœa becomes gradually less and less bilious or feculent, until at length the characters of the premonitory stage are clearly and unequivocally developed. When the diarrhœa is profuse, the transition is generally sudden; but when mild and prolonged, then the transition is gradual—that is, serum or muco-serous fluids are discharged, intermixed with the bilious and foecal matters voided.

With respect to the transition from the premonitory into the cold stage, I can offer but little satisfactory.—It is certainly not a stage of very long duration, nor are the transitions into the cold stage in the majority of instances abrupt or well characterized. In many cases, the pain in the proecordia prevails from the beginning even of the preliminary dysentery : in other instances, its appearance marks the commencement of the premonitory stage ; while, in others, it is not perceived till the formation of the cold stage. It may, however, be observed of the premonitory stage, that, generally speaking, it is not one of long duration, nor is the transition from it to the cold stage abrupt or well marked.

The transition from the cold stage to collapse is still less sensible. The retching which prevailed at the termination of the premonitory stage, and which was superseded by vomiting on the transition into the succeeding stage, will not serve to characterize the termination of the cold stage, nor the beginning of collapse. In most cases there is a gradual cessation of both the vomiting and purging during the collapse ; but then the collapse at this period, and its characters, are sufficiently well marked to determine its presence, and the height of its intensity. However, a careful and vigilant observer will perceive the gradual accession of characters which will enable him to anticipate what is approaching, and frequently to provide for the emergency.

The transition from the cold stage, or from collapse—for this takes place from either—into fever, is better marked. Thus, a commencing warmth of the surface, a warmer feel of the tongue, a kind of fur on its dorsum, the moisture of the former stages, and the smoothness and softness of its feel, giving place to the dry rough

hardness of fever, fully characterize the transition from the one stage to the other. Perhaps this is the best marked transition of the whole complaint.

THE MORBID ANATOMY AND PATHOLOGY OF CHOLERA.

THE Morbid Anatomy of Diseases may be considered under three heads—namely, The morbid appearances which are essential, *i. e.* which are invariably observed. *Secondly*, Those which are accidental, that is no way necessary to constitute the complaint, but have arisen from the operation of previous causes, not connected with the existing disease; and, *thirdly*, Those which are consequential, and of course consecutive. It will hardly be necessary for me to enter here at any great length upon these subjects, after the full consideration I have given to them in the *Cholera Gazette*, the *Lancet*, &c. I can only say, that my more mature experience has served to confirm me in the opinions which I have there advanced and maintained. I have now either opened myself, or assisted others, or have been present at the examination, of between three or four hundred bodies of persons who have died in the various stages of Cholera, and I must confess, that I have not met with any thing to induce me to change the views—so far as they go—which I have already advanced and maintained, on the morbid anatomy and pathology of Cholera. I shall, therefore here, only briefly recapitu-

late the facts which I have elsewhere stated, and introduce a few others illustrative of the morbid anatomy of the stage of typhoid reaction.

In Cholera, death happens only in two periods of the disease,—namely, in either the collapse or the fever. When a patient dies in collapse, the most obvious morbid characteristic is the altered condition of the blood. It is invariably of a pitchy black colour, and for the most part of the consistence of a liquid mixture of pitch and tar: it is of a rather thicker consistence than treacle. This is a very characteristic feature in the complaint. The left, as well as the right cavities of the heart, contain blood of this description, and the same sort of blood is found in the aorta. In the cavities of the heart clots of semi-coagulated blood, quite soft, and of a semi-fluid consistence, melting or dissolving down, as it were, under the pressure of the fingers, are found. The different structures—the organs and tissues, are pervaded to a greater or less extent with this blood. On incising the substance of the heart and liver, dark or black fluid blood flows out in great abundance. This altered condition of the blood, I have observed in every dissection which I have witnessed after death during collapse. The blood never, in these cases, shews any traces of serum; and the blood drawn during life in the cold stage, or immediately after reaction has commenced, never separates into serum and crassamentum, as in ordinary circumstances. The intestines nor their coverings present any unusual appearance; but the internal surface and the mucous lining generally presents a blanched appearance. Sometimes the mucous lining seems of a muddy or gruelly looking colour, but this arises entirely from the adhesion of the mucous secre-

tion, which frequently characterizes the vomiting and purging in the disease : but on washing the mucous lining off, the coat seems blanched, as already described. More frequently, however, the contents consist of a limpid colourless fluid, mostly possessing an alkaline reaction, particularly in the intestinal tube, although occasionally the fluid in the stomach presents a slightly acidulous one. There is one thing also observable, that although the gall-bladder is full, and frequently very much distended with bile, yet the usual reagents will not indicate the presence of a single particle of bile in the gastro-entric contents.

The bladder is invariably contracted and corrugated on its internal surface,—at least so far as my observation and experience go. It now and then contains a small quantity—about from half a drachm to a drachm of liquid mucus—sometimes closely resembling pus, but more frequently it is perfectly empty. In those instances in which mucus was found in the bladder, there was a desire during life, without the ability, to pass off the urine.

The brain, like the other viscera, seems to have its substance darkened by the quality of the circulating fluid. The veins and sinuses contain very dark coloured blood, and, on incision, it flows out abundantly.

The accidental morbid appearances would in fact comprise those of all the diseases to which we are subject. Although these conditions do not constitute an essential of the disease ; yet as frequently giving a character to the morbid manifestations, it is right that we should keep the fact in view, that we be not deceived, or consider as anomalies, manifestations which are perfectly intelligible, and readily explained. These states,

too, will frequently give a decided character to what otherwise would not amount to more than suspicious symptoms, and indeed often greatly aggravate the complaint, and increase its severity.

The consecutive appearances properly belong to the typhoid stage. They are almost wholly of a vascular character. I have, however, upon several occasions in London, observed a contracted state of the colon, more particularly of the descending. This possibly may be the consequence of spasm, and may perhaps take place during the cold stage, when the cramps and spasms, &c. prove most severe. During the febrile stage, the spasmodic contraction probably becomes, as it were, permanently confirmed. It is not, however, a constant appearance, and can only be looked for in occasional instances.

Another appearance has, I believe, been observed in some few cases, although it has only occurred to my observation three times—I mean intus-susception of the bowels. In one man there were three; but in the case of a child that died in the Cholera Hospital at Bethnal Green, during the typhoid stage, the intestines were intus-suscepted in thirteen different places. This arose no doubt from the violence of the spasms during the Cholera; but the whole of the *fœces* having been voided, the inconvenience, which under more ordinary circumstances would have been experienced, was not felt.—That they resulted from the spasms, I concluded from the shrivelled corrugated appearance of the canal at these places, and throughout different portions of its length.

However, the true consecutive appearances, as already observed, are of a vascular description. Now, in all

fevers, as well as in the typhoid stage of Cholera, the morbid vascularity presents two very remarkable differences. In both there is an apparent accession of vessels—that is, parts which are naturally colourless, assume a colour from distension of the vessels, with a coloured, instead of their naturally limpid fluids. Now, there is a very marked difference in the colour; in one case, it is of a red hue, approaching to vermillion; in the other, it is of a dark purple. The former may be considered as approaching in its nature to inflammation, and perhaps has its seat in the capillary arteries, while the latter, no doubt, is seated in the *lymphatic or colourless veins*.* In the former, the blood is possibly true arterial; in the latter, probably venous. The former, perhaps, may be designated *sub-acute inflammation*; the latter, *veno-congestive inflammation*.

What has been termed congestion in fevers, may perhaps be considered as reducible to the two varieties of morbid vascularity, now described. It will not here be necessary to enter upon the phenomena, according to the organ which may be the seat of this morbid vascularity, but merely to consider it with regard to the brain, for the patients that die in the typhoid form of fever, consecutive to the collapse of Cholera, invariably seem to perish from cerebral derangement, of one description or other. It has been asserted, that the mental faculties are no way disturbed from the commencement to the fatal termination in Cholera. This, however, is far

* Whether this be the true solution or not, there can be no doubt of the facts. In the Dublin Hospital Reports, the characters of these morbid vascularities are noticed, and in Christison on Poisons, the errors which some have fallen into, by designating every species of morbid vascularity inflammation, are pointed out.

from being in accordance with my observation. Delirium, coma, and stertortous breathing, have frequently appeared during the typhoid stage; and whenever this form of fever was well marked, delirium or coma to some extent, greater or less, generally prevailed. In enumerating the symptoms, retention of urine has been noted as a symptom in the latter stages of the fever; and this no doubt arises from a kind of vesical paralysis from nervous torpor. A man, a fish-curer, named Calder, having been admitted into the Hospital at Wick, died in the typhoid stage. He suffered from coma, slow laborious stertortous breathing. On examination, the bladder was found full of urine, though not remarkably distended.

In the coma there are two states of the eye to which I am anxious to direct the attention. The eye is dull and suffused in both; but in one the pupil is *contracted*; in the other it is *dilated*: in both there is a total insensibility to the stimulus of light. The contracted pupil marks a sub-acute inflammatory action of the capillary arteries; while the dilated infers veno-congestive inflammation. The former is the more fatal, and of course presents the most unfavourable prognosis.

Although the same order of consecutive phenomena present itself in the other organs and tissues, it will not be necessary to consider them in this place; because, although they may to a certain extent aggravate the symptoms, yet they seldom, if ever, prove the cause of death. At all events, what has been already observed upon the general question, can be easily applied by the competent practitioner to particular cases.

With respect to the pathology of the disease, it may be observed, that the cause, whatever it may be, exerts

its influence primarily upon the nervous system. This influence at first causes the discharge of the bile and feculent matters from the intestines. This is followed by a discharge of the serum of the blood.* Hence, the blood being deprived of its watery and saline principles, becomes thick and black, and incapable of preserving the healthy excitability of the different organs. The heart being the first supplied, of course its substance is first injected with unhealthy blood, and its excitability is the first impaired, and proportionably to the morbid condition of the blood. Thus, if the blood be only partially deprived of its serum, what I have designated the *cold stage* takes place; but if the blood be wholly deprived of this principle, then *perfect* collapse, from which recovery is very rare, supervenes.

It has been asserted that the intellectual faculties are never disturbed in Cholera, not even within an instant of dissolution; and it has been objected to me, that if the pathology I support were true, the intellectual functions should suffer as all the others. In the first place, the history of the cases in this Hospital, and generally throughout Wick, and which will be published in one of the Journals, by my friend and colleague, Dr. Miller, will show that coma and stertor frequently attend the termination of the collapsed stage when fatal, and that sub-delirium and stupor supervene the advanced period of the typhoid stage. But still, allowing otherwise, the fact would not be at variance with my views; because, as the excitability of the heart is impaired, its powers

* This has been unequivocally proved by the satisfactory experiments of Dr. Oshaughnessy, and his conclusions, &c., have been fully confirmed by Rose.

become enfeebled, and consequently the impetus given to the blood is inadequate to its complete propulsion, and the vessels of the more distant organs and tissues are not injected; therefore, they suffer from an imperfect stagnation, rather than injection with a poisonous fluid.

When the patient survives the cold stage or collapse, unless some critical termination supervene, he gradually enters into a stage of typhoid reaction. I have witnessed petechiæ in one instance, and in several desquamation of the cuticle succeed. It is unnecessary here to enter farther into the typhoid pathology. The reader, anxious for farther information, is referred to the *Cholera Gazette*, and other works upon the subject.

ON THE CAUSES OF CHOLERA.

THE predisposing are starvation, a poor watery diet, grief, anxiety, fear, drunkenness, and all sorts of intemperance, &c. In short, any thing which tends to emaciate the body, enfeeble the frame, or depress the spirits. However, there is no one of these capable of itself of producing the disease, and therefore we must look for some more immediate exciting cause. There are but two which have been looked upon as capable of producing this disease—namely, malaria and contagion. My opinions upon these questions are already before the public, and I need, therefore, hardly again enter at length upon the subject. Suffice it to say, that a very

extensive and matured experience has only served to confirm the views which I have already advocated. The evidence which has traced the disease to contagion, is as convincing to my mind, and proves the contagious character of the disease in the cold, the collapsed, and the typhoid stages, as fully as such a subject will permit. However, I do not believe that either the preliminary diarrhœa or the premonitory stage are, generally speaking, contagious. In fact, contagion is not an integrant of febrile disease; but an accessory—the product of the morbid operations of the animal economy, while labouring for a time under the influence of fever. Thus, if a person be exposed to the contagion of typhus, he is seized with fever; but the commencement of that fever is not contagious, although it becomes contagious during the morbid operations of the animal economy. Therefore, contagion, according to this view, is not a primary, but an acquired principle.

DIAGNOSIS AND PROGNOSIS.—The Diagnosis of Cholera is not very difficult in either the cold or collapsed stages, and, unfortunately, here it is not of that material importance. A diagnosis in the preliminary diarrhœa and in the premonitory stage would be of infinitely greater utility. I know of no means of determining whether the diarrhœa be the preliminary to an attack of Cholera or not; unless, indeed, it be the frequency and severity of the purging. There is in some cases a most anxious expression of countenance, and not unfrequently in very severe cases the voice is much affected, so that the intonations are in a whisper, and scarcely audible. However, the *vox cholericæ*, as it is called, is not to be looked upon as an invariable symptom, as frequently it never appears at all, even in fatal cases.—

However, when it does, it may be taken advantage of as a very characteristic diagnostic.

The premonitory stage is easily determined by the appearance and alkaline reagency of the dejections from the bowels. They are limpid like water, and a curdy shreddy rice-looking matter subsides. This frequently consists of fibrine and albumen,—the latter is readily detected by the Prussiate of potass. I have seen several instances here, in which the dejected fluid resembled the washings of beef. It depended entirely upon a slight intermixture of the red particles, or rather coagulum of the blood with the dejected matters. I at first supposed this appearance might have been caused by menstruation or hæmorrhoids; but careful inquiry soon satisfied me that it depended upon neither one or the other of these causes. The cold and collapsed stages require nothing in the way of comment. Their diagnoses are sufficiently characteristic, and admit of neither doubt nor ambiguity. The *vox cholERICA*, though often wanting, yet is, generally speaking, an attendant upon these stages.

It has been said that the typhoid stage of Cholera presents nothing characteristic whereby it may be distinguished from the more ordinary forms of typhus; and if we except the duration of the disease, this may be considered true. However, this typhus proceeds more rapidly to a termination, whether fatal or to convalescence. The *vox cholERICA* too frequently remains throughout this fever; and the patient, with the dull glassy suffused eye, the dry brown or black tongue, and the leading symptoms of typhus, yet frequently continues cold. The burning sensation in the stomach is often severe, and frequently vomiting, and even purging of bilious serum,

rendered green by some acidulous reagency, prevails throughout. On the whole, the previous history, when it can be depended on, affords the most unerring means of diagnosis.*

PROGNOSIS.—With respect to the prognosis, I can say but little. It must generally be guarded, and but seldom too favourable. In the preliminary diarrhœa—unless the patient be a most inveterate drunkard—the prognosis is favourable. In the premonitory stage, though not quite so good, still it is not unfavourable.—In the cold stage it is doubtful; but in collapse, hopeless. In the typhoid stage, we must be guarded. The suffusion of the eye of itself betokens danger; with dilated pupil still more so: with contracted pupil, the case is hopeless.

Hiccup prevails occasionally and indifferently during the last three stages. In the cold and collapsed stages it may be considered as favourable, though not universally so. During the transition from the cold or collapsed stages into the typhoid, it also augurs well—certainly not unfavourably—but in the advanced periods of the typhoid stage, I do not like it. I have not witnessed many recoveries in such circumstances.

The general habits, temperament, &c. of the patient, are to be taken into account. The aged and infirm stand the worst chance. The habitual drunkard has little to hope, and if aged, his doom is inevitable. The young and healthy, and such as have not abused their constitutions, are least likely to suffer; still the virulence of the

* In a practical point of view, the diagnosis is matter of little moment; but as it frequently happens, cases in this stage are referred to the physician to settle any doubt as to their nature, it is requisite to know the means of distinguishing them.

disease is sometimes so great, that the strongest constitution, and under the most favourable circumstances, is unable to resist its ravages.—From what has been already stated, it is evident, that if we wish to preserve our reputation, we cannot be too cautious nor too circumspect upon this question. We should avoid being dogmatical : neither encouraging too much on the one hand, by holding out false hopes ; nor too depressing on the other, by a peremptory decree of inevitable mortality.

ON DEATH AND CONVALESCENCE.

DEATH may happen in any of the three last stages, although it does not often occur in what can be strictly called the cold stage. However, I have seen an instance or two, of persons dying without the full developement of collapse. In such cases, the morbid anatomy has generally disclosed some organic disease of the heart, as hypertrophy, polypus, or some fibrinous excrescence, attached to the internal walls. Death seldom, in this country, occurs in the premonitory stage. I have seen but one instance, and then the patient died suddenly, or rather unexpectedly. The morbid anatomy disclosed disease of the brain, particularly ramollissement, and a very large quantity of serum in the ventricles.

Death, however, is of very frequent occurrence in collapse, and perhaps it is one of the most fatal stages.—The patient occasionally dies comatose, and the vital

functions seem gradually to cease, from a total failure of the natural excitability.

The febrile stage is also a fatal one: however, it is more manageable, and the principles of its management better understood than the preceding stage.

CONVALESCENCE.—The mode of convalescence is a subject of rather greater interest than what we have just now been discussing. Convalescence may take place from any stage, without the intervention of any of the consecutive stages. But where immediate convalescence occurs, it is almost invariably ushered in by some critical evacuation. The most frequent and the most common crisis is sweating. The next is a flow of urine, and the third urinary deposits. Crisis take place most frequently in the preliminary diarrhœa. If we can succeed in inducing a crisis, particularly sweating, at this period, we generally cut short the disease. In this District,* we have treated between seven and eight hundred severe diarrhœas,—the bulk of which I have no hesitation in saying, would, if neglected, have run into Cholera. They generally presented some slight degree of fever, with rigors, pains in the head and limbs, and generally slight cramps. These diarrhœas were not returned in the Daily Numerical Reports. In fact, no cases of Cholera were returned at all, unless they unequivocally presented the characters by which I have distinguished the premonitory, or some of the consecutive stages.

The premonitory stage also is terminable by crisis. This, however, does not take place so frequently as in the preceding stage. However, as convalescence is

* The Parish of Wick.

often the immediate termination of this stage, we are justified in endeavouring to induce a critical termination.

The crisis to the cold and collapsed stages, appears to be febrile reaction. Fever, of one character or other, and of greater or less intensity and severity, almost always supervenes these two stages, when protracted or not fatal. I have certainly seen instances of direct or immediate recovery; but they are certainly very rare. Therefore, the crisis which we should attempt in these instances, is the superinducing febrile reaction, which, when established, we must endeavour to limit and control, upon principles which I shall hereafter have occasion to explain.

The reaction which succeeds the cold and collapsed stages, is a genuine typhus. We know that all cases of typhus, even when epidemic, do not assume alike, or in an equal degree, the same malignant characters. Some of them present symptoms of comparatively much greater mildness; and this is *cœt. par.* generally proportioned to the period at which the disease has come under professional treatment. Now, when we see a fever at its very commencement, we can often cut it short, and thus prevent the perfect developement of the febrile manifestations. I have seen abundant instances of this; and there can be no doubt that such cases, if left to themselves, would manifest all the phenomena of typhus in the usual consecutive order. This check has been invariably effected by some critical discharge, whether of sweat, urine, bile, or blood. The attempt to accomplish this object, however, to be successful, must always be made at the commencement of the fever. If the disease has advanced, any attempt to arrest its progress will be vain

and futile, if not positively injurious. All that we can do then at an advanced period, is to regulate the progress of the disease, modify the intensity of the symptoms, and subdue the severity of the consecutive manifestations—or the sequelæ, as perhaps they may with equal correctness be called.

Now, the fever which supervenes the cold and collapsed stages, or, perhaps more correctly speaking, develops itself at these periods, has already advanced too far for successful attempts to induce crisis. The fever existed from the beginning, and the period for inducing a crisis has passed. Therefore, we must pursue the only other management open to us : namely, to subdue the severity of the symptoms during the progress of the disease, and to prevent the formation of those organic derangements which are usually the cause of death in fever.

TREATMENT.

THE Treatment may be considered as comprising two heads—namely, the therapeutics and the prophylactics. The therapeutics will comprise the medical management of the various stages : the prophylactics, the management of convalescence, and the sanitary precautions which it behoves communities and all interested, in checking the progress, and limiting the extent of the disease, to adopt.

Treatment of the preliminary diarrhœa.—In the management of this period, we have two indications to fulfil—First, to check the diarrhœa; Secondly, to induce a crisis. There is no means familiar to my experience so successful for this purpose, as a combination of calomel and Dover's powders. The calomel seems to keep up the healthy quantity of bile in the system, and favours its flow from the gall bladder into the intestines; while the Dover's powder promotes the action of the skin. I have tried calomel and opium separately and combined, but they are very inferior in power and efficacy to the other formula.

In order to increase their astringent powers, a proportion of the compound powder of chalk is added, and given in small doses, and at short intervals.* In children, or where there is a peculiar irritability of the bowels, and which is sometimes greatly increased by calomel, I give the blue pill, or the grey oxide in preference to calomel. The grey oxide may be substituted in the powders for the calomel. It has been objected that this preparation is liable to become peroxidated;† but I have some reason to believe that the peroxide in this case is derived from the impurity of the calomel

*Calomel, grs. 12;
Pulv. Doveri, grs. 10;
—Cretæ Comp. scrs. 2.
12 powders,—one every
half-hour, hour, or two
hours, according to
circumstances.

Pil. Hydrarg, $\frac{1}{2}$ drn. to
2 scrs.;
Pulv. Doveri, grs. 10
to 20;
Pulv. Cretæ Comp. scrs.
2;
Extract Hyoscyami;
Sufficient to form into
24 pills—2 or 3 for a
dose, at the usual in-
tervals.

Oxyd. Hyd. Ciner;
Pulv. Doveri;
Extract Hyoscyami;
Sing. scrs. 1—make into
12 pills—1 for a dose,
every hour, or every
other hour.

† Dr. Barker.

from which the oxide is prepared. The grey oxide is generally prepared by decomposing calomel with lime-water. If the calomel, or whatever other salt of mercury may be chosen, contain corrosive, sublimate, or any salt of peroxide, of course peroxidated mercury will be precipitated.

The other effects which I have witnessed from pursuing the above plan, is a very rapid diminution in the number of stools, and a very sensible alteration in their consistence. They become more solid and better coloured. A perseverance in the above plan is soon followed by copious perspiration, which always proves critical. If perspiration succeed, the patient generally becomes convalescent, and with common care, gives no farther trouble. The Rev. Mr LOVI, Dr. MILLER, and myself, have had, within the last eight weeks, between 7 and 800 patients of this description, who were completely relieved from severe diarrhœa by these means alone, and more than three-fourths of the above cases would unquestionably have run into Cholera.

I have very seldom found blood-letting necessary at this period. But if there be any local symptoms indicating inflammatory action, or any vascularity of an active character, then blood-letting proportioned to the urgency of the symptoms, should be practised. However, in the whole range of cases to which I have above alluded, bleeding was resorted to in ten instances only.*

Although the characters of the diarrhœa varied in different cases,—being in some bilious, yellow, green, or fer-

* The great bulk of the diarrhœas fell into the hands of the Rev. Mr. LOVI, the Catholic Pastor of Keith. To his zeal, activity, and unremitting exertions, this neighbourhood is greatly indebted. I therefore saw only the severer forms of the prevailing diarrhœa.

mentable like yeast, black, white, or clay-coloured,—I found the above plan equally applicable to all ; nor has one instance fallen under my observation, or come to my knowledge, of mischief occurring from the indiscriminate adoption of the above method,—a circumstance which I think goes far to prove that all these diarrhœas were nothing else than the preliminary to an attack of Cholera, and which would have inevitably followed, had not preventive measures been adopted.

When the diarrhœa is very severe, and seems to be exhausting the patient from the number of the stools, and that griping and abominal spasms are troublesome, I have found the following draught eminently serviceable :—

Pulv. Cretæ Comp. grs. 10 to 20 ;
 Liquor-Opil. sed. drops, 20 to 40 ;
 Aquæ Cinnamomi, drms. 12 ;

A draught to be taken immediately, and repeated if necessary.

As thirst generally prevails all through, I have permitted, and indeed encouraged, the free use of toast-water, thin gruel, or common cold water, which last the patients themselves generally prefer, and I put no restriction upon them in this particular. By the adoption of the above means, the most urgent diarrhœa will be subdued, unless, indeed, it has been so long neglected, that the disease has been established in the constitution, and must go through its course.

Treatment of the Premonitory stage.—The Premonitory stage, as already described, is indicated by the limpid, muddy, or rice-looking appearance of the stools. By the absence of bile or feculent matter in the dejections, and by their alkaline reagency : the gastric irrita-

tion denoted by retching, pain in the epigastrium, and a burning sensation in the stomach, with great thirst. As the serum of the blood appears to be passing off during this stage, the obvious indication is to prevent this as far as possible, and to supply as well as we can that which is already deficient. For this purpose, a more astringent treatment is required: but we must not forget that some of the functions are suspended, and that the secretions are partly retained. Thus, the skin becomes dry from the suspension of its functions, while the secretion of the bile goes on, although the fluid itself is retained in the gall bladder, and does not flow into the intestines. In this case, we increase the quantity of calomel and Dover's powders, and add to it Gum Kino and Catechu, to produce the necessary astringent effects. Of course the mode of combining and exhibiting his remedies, must be left to the judgment and discretion of each practitioner; the principles only which should regulate the practice can be laid down. I may, however, state, that the following formula was drawn up by me, and published by authority of the Local Board of Health of this place, and recommended under their sanction for general use:

Calomel, grs. 20 ;
 Pulv. Doveri,* grs. 15 to 20 ;
 ——— Gum Kino, drm. $\frac{1}{2}$;
 ——— Catechu, scr. 1 :
 ——— Cretæ Comp. drm. 1 ;

Divide into 12 powders—one to be taken in a little treacle or honey, or any thing thick, every half hour,

* It has been objected that opium produces congestion in the brain. This in the abstract I believe is true: nor does calomel even appear to protect the system from the congestive effects of opium. However, when it is determined to the skin, as in Dover's powder, congestion seldom or never

hour, or two hours, according to the urgency of the symptoms.

In some cases, we here administer the calomel, the blue pill, or the grey oxide, whichever may be preferred, with the Dover's powder, either in the form of powder, or combined with extract of Hyoscyamess, so as to afford the proper consistency for pills. Then we give the following astringent mixture, in doses of two table-spoonfuls at intervals, regulated by the circumstances of the case :—

Pulv. Cretæ Comp. 2 drms. ;

Tinct. Kino, 4 drms. ;

—— Catechu, 3 drms. ;

℞ Aquæ Cinnamomi, 6 oz. ;

To which may be added, if necessary, one drachm of Liq. Opii. Sedativ.

I observed, during the prevalence of the typhus fever in Ireland, of which I saw so much, that even after the fever was fully formed, provided it was at an early period, the system was then for the most part readily brought under the influence of mercury. It was also observed of the same fever, that when the mercurial influence was once established in the system, although its progress could not be thus wholly arrested, yet those organic congestions of blood, which prove so troublesome to the physician during the advance of fever, sel-

follows. Neither should the dose be so large as to produce even the least possible congestion. I have, however, substituted the following formula with good effect for that of Dover's powder :—

“ *Pulvis Muriatis Morphice Comp.* ”

Mur. Morphicæ, }
Ipecacuanhæ, } part. equal.
Muriatis Sodæ, part. octo.

“ *Pulvis Sulphatis Morph. Comp.* ”

Sulph. Morphicæ, }
Ipecacuanhæ, } part. equal.
Sulph. Potass, part. octo.

These may be given in the same doses as the common Dover.

dom or ever formed ; and the fever itself did not assume its usual malignant characters, as petechiæ, sordes, &c., but took on the milder character of the bilious remittent, peculiar to the fall, or of the simple continued fever, so prevalent in the spring of the year. Now, with the recollection of these facts before me, and believing, as all who are acquainted with my opinions know, that the epidemic now prevailing so extensively in this kingdom, is nothing else than a combination of Indian or Asiatic Cholera, with typhus fever, from which latter it derives its contagious characters, I resolved to treat this disease as I would the same periods of the more ordinary forms of typhus. Under these circumstances, it is always an object of primary moment with me, to superinduce the mercurial influence ; and I can appeal to the experience of my colleague to show, that when we succeeded, we never after experienced any great difficulty in the management. It is true, that the consecutive stages succeeded each other, nor was the course of the disease shortened ; but we never had any organic sequelæ to contend with, nor was the convalescence deferred, keeping the patient, as it were, balancing on the pivot of his destiny, neither advancing towards recovery, nor sinking under the approach of death.—Therefore, to superinduce the mercurial action in the system, is at this period not only safe, but active and efficient practice *. But the practitioner must not suppose that he can effect his purpose by the wholesale introduction of mercury, as if he were storing up merchandise in a warehouse. He who acts upon such a princi-

* We have not on record a single instance of death, in which mercurial action had been excited in the system.

ple will be miserably disappointed. It was observed of the typhus in Ireland, that although the mercurial influence, when once established, secured the recovery of the patient, yet mercury when profusely administered, without superinducing its specific effects, not only failed to protect the patient, but often hastened the fatal termination, reducing him, the victim of cutaneous ulcerations, gangrenes of the fauces, and mucous membranes, and every other species of cachexy. If, therefore, we cannot effect our object by the mild and moderate exhibition of mercury, we must give up the farther exhibition, and trust to the protective or sanative influence of what we have already thrown in.*

There are, however, several methods of rendering the system more susceptible of the mercurial influence: independent of opium, Dover's powder, &c., the chief are bleeding, and emetics in nauseating doses. They appear to awaken the dormant absorbent powers of the system, so that constitutions which before had resisted, now readily yield to the introduction of mercury. Bleeding I have myself tried upon several occasions, and with good effect. But to be successful, indeed not positively injurious, it must be practised at an early period, otherwise the cold stage is readily induced, and this is then apt to run into collapse.

With respect to nauseating doses of emetics, the Dover's powder, as already recommended, will be found more successful than any other means. However, it

* Soreness of the gums, with slight pyalism, is to be regarded as the most unequivocal manifestation of mercurial influence; but it would be a dangerous error to suppose that this influence has not been induced, because we have been unable to affect the gums, or excite pyalism.—Need I refer to the history of the present epidemic as an illustration.

will sometimes happen; and in particular constitutions, that even the smallest doses of opium disagree. In such cases, I administer the mercurial in combination with compound powder of chalk, Kino, and Catechu. It may happen, and sometimes it is the case from the very beginning, that the sensibility of the gastro-intestinal mucous lining is such, that it will not bear the internal administration of mercury, under any form of preparation, nor under any modification of combination. In such cases, mercurial frictions, or mercurial vapour-baths or fumigations, present us with the only alternative; and, indeed, when there is considerable gastro-intestinal sensibility, perhaps the internal administration should always be assisted by mercurial friction.

The result of this plan often is the reappearance of bile in the discharges. This may be either of a yellow or a green colour, the rationale of which has been already explained. If of a bright yellow, the mercurial may be continued, because this generally arises from a deficiency and consequent dilution of the bile. The green depends upon an acidulous reagency, and should be corrected by the absorbent earths, and other well known correctives. A deep brown is the most natural and healthy colour, and proves that the mercurial has fully performed its duty.

Sometimes the retching in this stage becomes very distressing, and brings on great soreness and tenderness of the præcordia. In such cases, the plaster of muriate of ammonia and soap, described by Paris in his Pharmacologia is very useful; but its effects being very gradually produced, it is not suited to urgent cases. Either the mustard sinapism with a tea-spoonful of salt, or caustic ammonia, diluted according to the severity of the symptoms, may be substituted. Every one knows how

to apply a mustard cataplasm. For the diluted ammonia, a compress of linen or lint, wetted with it, and placed on the part, is the proper medium of application.

I have found great benefit too in this stage, as well as in the preliminary diarrhœa, from the immersion of the feet and legs in hot salt water. Indeed, a hot salt water bath would be still more adviseable ; but as in a great proportion of instances the bath is impracticable, I have then contented myself with the immersion of the feet in a pail of hot salt water. The patient should then be put to bed, and the treatment regulated upon the principles already explained.*

Treatment of the Cold Stage.—I have already observed, that we must regard fever as the only favourable termination to this stage. If neglected, in 99 cases out of 100, transition into collapse will be the result.—How then is reaction to be induced? Let me warn against the stimulus of brandy and other ardent spirits. The most rapidly fatal cases, and attended with the severest cramps, and excruciating tortures which ever occurred in this neighbourhood, were those in which the patients or their officious friends, sought relief by the administration of whisky or brandy. There was one case occurred in this Hospital, (William Hogg), who having suffered from the premonitory stage for some little time, being suddenly seized with cramp, his friends

* Since this sheet was sent to Press we have tried the salt emetic in the premonitory stage, and with very good effect. Two effects have been the result,—in some a critical solution of the disease, in more obstinate cases a transition to the febrile stage without the intervention of the intermediate stages. But I have not a sufficient experience in the practice to justify more than a mere simple notice of the above facts.

administered somewhere about a half mutchkin of whisky. He was brought to the Hospital, and died in about three hours. I have seen two or three other cases of a similar description. The best method of inducing reaction is by the repeated administration of a saturated solution of salt warm, till full vomiting, with some degree of reaction succeed. The directions given in this Hospital, as the most intelligible, are to put three or four handfuls of salt into boiling water, and when all the salt that is soluble in the fluid is dissolved, to add as much cold water as will reduce the heat, so that it may be swallowed. Of this the patient is to have a breakfast cupful every five or ten minutes, till vomiting take place. This is generally followed by some degree of reaction: the pulse becomes more firm and sensible, and sometimes hard. The tongue becomes warmer and coated, the face flushes, and the respiration becomes more hurried. If the patient should relapse or fall back again into the cold stage, then the emetic should be repeated every half-hour, until reaction is permanently established. I admit that it will occasionally happen, that although we may succeed in establishing temporary reaction, yet it will not be permanent, and the patient at last becomes collapsed, and dies. This I have witnessed upon one or two occasions; but I invariably discovered that these persons had, for a considerable time previously to their attack, indulged in spirituous potations—in fact in bestial drunkenness. I could present a tabular record of these instances, but a degree of respect for the feelings of surviving relatives, induces me to withhold the particulars.

It has been already hinted, that the blood during this stage is gradually parting with its watery and saline

principles, and therefore to supply the deficiency seems to be a feasible indication. I have seen what has lately made so much noise in London, under the name of "the Saline Treatment," adopted, but uniformly with unfortunate results. At the request of the Central Board of Health, I tried it in the Bethnal Green Cholera Hospital, when Physician to that Establishment. Every patient died. It was tried at the White House, and the result has been published by the professional gentlemen of that Establishment. I must confess that the effects were precisely what I anticipated—namely, a transition into collapse. Now, the saline is merely the refrigerating treatment of Cullen and others, under a new name. The exhibition of saline solutions induces cold, reduction of pulse, &c., the very things we should be anxious to avoid, for our object is fever, but the saline treatment removes or subdues fever.

The effects which I have observed from saline medicines administered in this way, are an aggravation of all the symptoms of the cold stage, and its conversion into collapse. I must confess, that from ample experience, I would dissuade from even the trial of it.

In endeavouring to manage the cold stage, we must not overlook the fact, that the blood is, as it were, inspissated and deprived of its saline particles. Every means of restoring the healthy condition of the blood should be attended to. What effect the salt emetic may have in this way, it is difficult to conjecture, but immersion in a hot salt water bath, experience has shown to be efficacious. Now, it is by no means improbable, that during the immersion, a large quantity of the saline fluid may be taken up by the skin and mixed with the blood, so as (in part at least), to restore its healthy constituency.—

Whether this be the principle, or that of “Endosmose,” described by D’Autrochet, I know not; but of this I am satisfied, that the blood, of persons, which would not separate into serum and crassamentum before immersion, when drawn after immersion, has separated, although more slowly than under ordinary circumstances. The bath is the preferable plan; but when this is impracticable, immersion of the feet and hands in a pail of hot salt water may be substituted.

During the cold stage, the thirst, which was inordinate in the preceding stages, still prevails, though not so urgent. I have found great advantage at this time to substitute well seasoned beef tea or gravy soup for the toast and water. Nor is this contra indicated by the burning sensation in the præcordia, for in fact it favours the accession of fever, which is the natural solution of the cold and collapsed stages. Gravy soup is perhaps the most grateful drink at this time; but if this cannot be procured, a very excellent substitute may be found in common beef tea, well seasoned with a due proportion of good mushroom Ketsup; or common water and Ketsup in equal proportions, or adjusted according to the taste of the patient. Generally speaking, this drink may be administered warm; but I invariably consult the taste of the patient upon these points.*

To relieve the vomiting and the burning pain in the præcordia, a mustard cataplasm, composed of two table-spoonfuls of flour of mustard, one tea-spoonful of common salt, with as much vinegar as will give it the

* It happens, but not invariably, that in collapse, and also in the cold stage, the breath is deadly cold. I have remarked when the breath is cold, or that the tongue is remarkably cold, then the drink is preferred warm. However, the rule above pointed out is the safest principle.

due consistence, should be applied to the epigastrium, by being spread on linen or brown paper.

Sometimes, however, the symptoms are so urgent and distressing, that there is not time to wait for the effects of the cataplasm. In such cases, vesication may be very speedily induced by placing a fold of linen on the part, and dropping on it, moderately, concentrated ammonia. I have seen these means afford relief, in several instances. While we are thus endeavouring to subdue the severity of the symptoms, we should continue the mercurial and astringent plan already pointed out, and the patient should be kept warm, by means of hot blankets, and the application of stomach and feet-warmers, &c.

If reaction do not speedily follow the above means, the patient soon sinks into the succeeding stage—namely, collapse.

Treatment of Collapse.—I can offer but little in addition on the treatment of this stage. It is to be treated much in the same way as the cold stage, only with greater activity. However, the practitioner who anticipates much success in the treatment of this stage, will, I fear, be disappointed. Recoveries certainly do, though rarely, happen; but still I believe we must not attribute much to the remedial means employed. Although I cannot point out much in the way of remedies to prove successful, I may warn against the employment of those which prove positively injurious, and mostly fatal. Among the first I rank brandy, and all other stimulants composed of ardent spirits. More, probably, have been killed by these means, than by the unassisted severity of the disease itself. Let us examine the object of brandy: to excite the enfeebled or arrested motions of the heart,

so as to continue the circulation. But does not the enfeebled state of the circulation, or its actual cessation, result from the injection of the substance of the heart itself, with poisonous blood,—thus destroying the excitability of the moving agent. Therefore, to excite the motions of the heart, while the blood remains in its unhealthy condition, is hopeless; and had we the means of doing it, they would prove most pernicious.

Another means, and to a certain extent more rational, has been proposed,—the injection of watery saline solutions into the veins. This at first sight seems a rational indication, deduced from the chemical pathology of the disease. However, it is physically impossible that it could effect the legitimate object—the dilution of the blood. A very superficial degree of physiological knowledge must be sufficient to prove this. The veins convey the blood or the injected fluid to the right side of the heart; but to be effectual, the dilution should be in the left; because the grand primary object is the supply of the heart's own substance with healthy blood, so as to restore its excitability. The dilution, therefore, should take place in the left ventricle. Then, perhaps, if the heart's excitability were not so far destroyed, as that it would not obey the stimulus of distension, the coronary arteries might be filled, and thus some good effected. But it is impossible to convey the solution directly to the left side—certainly not by injecting the veins, unless the foramen ovale could be opened—and, therefore, upon sound physiological principles, it cannot prove successful. This I predicted from the first; and although I have seen a good deal of it, and even in the hands of sanguine persons, I have never witnessed a successful case. We must, therefore, treat collapse as we

would the cold stage, but still more assiduously, in the hope that nature may effect that—namely, reaction—which we, in the present state of our knowledge, know not how to compass by art.*

Treatment of the Typhoid stage.—It has been already stated, that fever may supervene any of the foregoing stages, although it more frequently follows in the course before described,—that is as a consecutive to either the cold or collapsed stages. This fever, as was observed by Barry and Russel during their mission to Russia, generally put on a typhoid character. This fever, however, cannot be treated with success at least, as the more ordinary forms of typhus. The refrigerating plan, so useful in the other forms, is wholly inadmissible here. I have tried, in this stage also, what has been lately termed “the saline treatment,” and have always found it highly pernicious. From the typhus consecutive to Cholera, patients are apt even spontaneously to relapse into the cold or the collapsed stage. The saline treatment, in a state of disease, in which the tongue is so apt spontaneously to resume the coldness of the cold stage, with the state of pulse and skin coincident with it, appears to me eminently calculated to reinduce these phenomena, which it behooves us, by every means in our power, to prevent. I have had, upon many occasions, practical proof of these unfortunate results. I saw several instances of this in Whittlesea; and one case in particular, I remember, which apparantly was doing re-

* I certainly have seen reports of successful injections; and, therefore, I can only say, that if experience confirm the benefit, we are bound to practise them, though theory will not at present explain satisfactorily the rationale. I have given them a fair trial, and do not myself feel warranted in pursuing the plan.

markably well, but the pulse appearing to be very weak, a little carbonate of ammonia, dissolved in water, protected, too, by spirit of lavender, being given in small and repeated doses through the night, I found on visiting at the Hospital next morning, that he was shortly after seized with severe purging, became cold and collapsed, and died in the course of the day. My friend and colleague in this Hospital, too, can attest the severe effects resulting from saline remedies, administered under similar circumstances, so that we have totally proscribed them in our own practice, and interdicted their use to the patients in our Hospital.

The fever itself requires little else than mere dilution. This is best effected by common water, toast and water, or any other convenient diluent of a medium temperature—say from 50°, 60°, or 65° of Faht. Patients very seldom die of the mere fever, but of the consequences upon the brain, or some other important organ; but almost always affecting the brain. These derangements are mostly of a vascular description, and I have in another part explained my view of their nature. I shall now proceed to describe the treatment which I have found best adapted to each.

I consider the degree of suffusion of the eye as the most certain index of what is going on within the head, the state of the pupil, and the description of morbid vascularity in the brain. When the pupil is contracted, the vascularity partakes of the character of inflammation—inflammation certainly of the sub-acute kind. In this state, I open the temporal artery, and if sufficient blood can be drawn from this source, it is the best from which to take it. When the flow is not sufficient—from 10 to 12 oz. are generally required—the patient should be bled from

the arm. Nauseating doses of emetics are generally eminently useful in inflammation; but they will not do in this fever. I have found the true James's powder answer better than any other remedy. It generally brings on free perspiration, which is salutary, and a combination of it, with a very small proportion of a mercurial, promotes its action. The quantity of the mercurial should be extremely small: for in per-acute or active inflammation, large doses of mercury excite synocha fever, and lead to suppuration and abscess. In the sub-acute species, they excite low fever, mūco-purulent exudation, and ultimately ulceration. I, therefore, in this species of cerebral derangement, have given from $\frac{1}{8}$ to $\frac{1}{2}$ grain of calomel, or any other mild mercurial, with from 3 to 5 grains of James's powder, guarded by a sufficient quantity of extract of *Hyoscyamus* to form a pill; and this dose is to be repeated every half-hour, hour, or every other hour, till the symptoms give way, and perspiration succeed. When opium is indicated, which is not often the case, it is the preferable plan to add the requisite quantity of the *Pulvis Mur. Morph. Comp.* In order to prepare the stomach for a second dose, if it reject the first, a little Camphorated spirit may be given, in infusion of Cloves, or Tincture of Cloves in the Camphor julap. If this does not answer, the head should be shaved, and it will be well always to shave the head on the slightest appearance of suffusion of the eye, and blistered. An evaporating lotion*, when the head feels hot, should be applied before blistering.

* Composed of Alcohol, 2 parts; Ether, one part; and Camphor mixture, 3 parts. To a portion of this as much hot water as will render the whole milk warm, should be added, and a cloth dipped in it placed upon the head. It should be wetted as fast as it dries or becomes warm.

The above plan is applicable to inflammatory action, wherever seated, supervening the typhoid stage of Cholera. But I have already noticed a species of morbid vascularity, allied in some measure to inflammation, depending upon distension of the lymphatic veins, with dark-coloured blood. The treatment of this depends chiefly upon exciting the action of these veins, so as to enable them to get rid of their morbid contents. Mercury is our sheet anchor here, and it should be given so as to produce its specific effects in the system.

Bleeding, however, is the first means to which we should resort, and a quantity proportioned to the strength of the patient, and the urgency of the symptoms, should be drawn from the jugular, if possible, when the eye is much suffused, the pupil greatly dilated, with coma and laborious stertorous breathing. In less severe cases, the blood may be drawn from the arm, as being more manageable. The mercury should now be pushed, and we cannot use a better formula than the one above, only reversing the relative quantities of the mercury and James's powder. Thus, we may give from three to five grains of calomel or the grey oxide, with from half a grain to a grain of James's powder, or Ipecacuanha, with the requisite quantity of extract of Hyoscyamus, to make into a pill every half-hour, or two hours, according to the urgency of the symptoms. The sooner we can bring the system under the influence of mercury, the sooner will the veno-congestive inflammation be resolved, and the brain restored to its healthy state. The nauseating effects of the James's powder in minute doses, probably assists the absorption of the mercury; and I have upon some occasions added a minute portion of Tartar emetic. In urgent cases, mercurial frictions and fumigations

should be had recourse to, in addition to the above.—The evaporating lotion should also be applied, as above directed, to the head; and in more urgent cases, blistering the nape of the neck should not be neglected. Such are the curative means which belong essentially to the treatment of the fever. It now remains for me to make a few observations upon some accessory symptoms, which have not yet been provided for. Some of these supervene all the stages; some are peculiar to the febrile stage.

The first, and by far the most important, is suppression of urine. This symptom is principally an attendant on the cold and collapsed stages. It should not be neglected, and no means likely to overcome it, should be left untried. When it prevails in these stages, the muriated tincture of iron, with compound spirit of juniper, administered in any appropriate vehicle, is the most powerful remedy, and the doses should be repeated until some effect is produced. From ten to twenty drops of the tincture, with one drachm of the compound spirit of juniper, may be given every two or three hours, till a flow of urine is produced. When suppression attends the febrile stage, but with dilated pupil, the proportion of muriated tincture should rather be diminished, but the above plan may be pursued, provided the febrile heat be not excessive.

When the pupil is contracted, and urinary suppression exists, I prefer acetic extract of *Colchicum*, acetic extract of *Juniper*, and extract *Hyoscyamus*, of each one grain, every two or three hours, with which may be taken one drachm of sulphuric æther, in one ounce of Camphor mixture. These will, in favourable cases, bring on a discharge of urine in any of the stages, in which suppression is troublesome

In retention, there is but one means of giving relief, and that belongs to the department of surgery. No practitioner can be at a loss in such a case to perform his duty.

OF THE TREATMENT OF CERTAIN ADVENTITIOUS SYMPTOMS, NOT ESSENTIALLY INTEGRANTS OF THE DISEASE.

Spasms and Cramps.—These may prevail at any period. Friction and the warm bath afford the greatest relief. The linimentum Saponis, with Spir. Terebinthinæ, and Tinct. Opii., combined in proportions, according to circumstances, I have found greatly to assist. When cramps alone prevail, the limb or limbs should be immersed in warm water, and after immersion, well rubbed with the liniment as above. When abdominal spasms prevail, the warm bath, with the friction as above, is the best remedy.

Flatulence—Often prevails in the febrile stage, and when prevailing in any stage, (for it is not confined to this stage, though more frequently present at this period), is a source of very great distress, giving rise to spasms and cramps. It is best relieved by a little of the Pil. Galb. Comp. with a draught, containing a few grains of calcined Magnesia, in a little aromatic—as cinnamon-water. In some cases, the foetid spirit of Ammonia, with a little of the Liquor Opii. Sedativ. and Tinct. of Hyoscyamus, gives immediate relief. I have never found flatulence an intractable symptom, unless where the

digestive organs were organically deranged, and this is not the place for the consideration of this subject.

Vomiting in the stage of Reaction.—This symptom sometimes becomes very troublesome. The discharged matter is perfectly limpid, like water. It resembles much what is discharged in pyrosis. This led me to adopt Pemberton's practice of Kino and Opium. The Dover's powder and Kino, however, I found more effectual.—From three to five grains of each may be given, at every accession of vomiting, and a draught, consisting of from 10 to 30 drops of the Sedative solution of Opium, in an ounce of Camphor mixture. If these means do not prove effectual, a blister should be applied to the epigastrium.

Purging.—Sometimes a purging prevails during the febrile stage. It assumes different appearances. Sometimes it looks like washings of beef: sometimes it is mucous-looking; but more frequently it is green. The free but guarded use of mercury, is the best restraining. When it is red like the washings of beef, the acetate of lead, the tartrate of iron, or the sulphate of copper, combined with Dover's powder, is the best remedy. I cannot take upon myself to say which of the above metallic restringents is the preferable.

When the motions are yeasty, whitish, or clay coloured, a combination of blue pill, the grey oxide, or calomel with Dover's powder, is the best remedial means.—When fermentation takes place, as may be known by the frothy condition of the motions, a combination of a mercurial, with Comp. Galbanum pill, Extract of Rhubarb, and of Hyoscyamus, in well known proportions, with which may be administered some absorbent,—as calcined Magnesia, suspended in cinnamon water, is, so far as I know, the most efficacious remedy.

Abdominal Tenderness with Tension.—The treatment of this symptom is entirely comprised in leeching, fomentation, blistering, and emollient clysters.

Vesical or Urinary Irritation.—Acetic extract of Colchicum, Hyoscyamus, Camphor, and Pulv. Muriat. Morph. Composit, present us with the most effectual remedies.

Anasarca swellings of the lower extremities—Are sometimes the consequence of the febrile stage, especially when desquamation of the cuticle has supervened the termination of this stage, or that the fever has been attended with much redness of the face or skin, or that any efflorescence resembling exanthematous eruptions has appeared in the course of the fever. These swellings, though sometimes considerable, of which remarkable instances have occurred in this Hospital, and several out of doors, readily give way to tartrate of iron, and supertartrate of potass, with the compound decoction of Sarsaparilla.

One very severe case, followed by cutaneous ulcerations—probably the effect of the mercury administered for his relief, occurred in this Hospital. Alex. Dewar, aged 20, admitted the 10th of August, completely blue, cold, pulseless, and senseless. He is now slowly recovering, under the use of the compound decoction sarsaparilla.

Three women were pregnant. In one labour came on during convalescence, but the labour making no progress, she was obliged to be delivered, by perforating the cranium. The child died during the attack of Cholera. She was seven months gone. Another miscarried—twins—between three and four months after conception. The third also miscarried. We have a fourth now in Hospital, uncertain as to the completion of her time, but

I think she will do well. Several pregnant women have gone on well.

Such is the result of my experience in the management of Epidemic Cholera. There are many circumstances, perhaps, omitted; but my object has not been the minutiae; but the leading and most frequent phenomena of the disease. I shall now proceed to the second head—the Prophylaxis.

PROPHYLAXIS.

CONVALESCENCE.—The Convalescence is generally short, and therefore requires but little treatment. It often happens, however, that during this period, especially on the solution of the fever, that the patient is attacked after meals, or in fact any thing being taken into the stomach, that the patient vomits it up, and the tongue becomes cold. This depends upon some peculiar irritability of the stomach, and it is almost always certain to attack pregnant women convalescent from Cholera. Nothing seems to allay this irritability so well or so speedily, as a little good mulled wine, or a little weak brandy and water. The tongue immediately becomes warm, and the irritability of the stomach subsides.

PROVISION FOR THE TREATMENT OF THE SICK.—Hospital accommodation is one of the first objects that should engage the attention of any community. It is idle to be speculating upon an immunity from the disease, and more have been sacrificed from an unwillingness to provide proper hospital accommodation, than perhaps is calculated upon. A suitable building should therefore be provided, with 6 beds at least for every thousand of the population. These should be kept for the accommodation of patients in the premonitory, the cold, and the collapsed stages.

For the patients, when in the febrile stage, I should strongly advise the erection of a Marquee. With the sanction of the Board of Health, I have adopted this plan here. A Marquee, about 40 feet long, and 16 or 17

broad, has been erected. A boarded flooring, raised about 3 inches from the ground is placed in the inside. In the centre is a hot air stove, with the funnel so constructed, that the smoke is conveyed downwards under the floor. Thus, the temperature can be raised or diminished at pleasure. By letting down the walls of the Marquee the air is cooled, and there is a thorough ventilation without any drafts or currents. Closing the walls and opening the air part of the stove, the temperature is again elevated. A thermometer suspended in the Marquee determines whether the Marquee or the stove should be open. Our Marquee has now been in operation for one month, and we have not lost a single case in the febrile stage since we put it in operation. Indeed, the typhoid characters seem to be completely suppressed by this management, for in the Marquee they all assume the more mild form of simple continued fever. The duration, too, of the febrile stage, seems to be greatly shortened by this means, as we find the sick recovered sufficiently to be discharged, in about two thirds of the time required when they went through the *entire* of the disease in the cholera building.

District Dispensaries for supplying medicines to persons labouring under diarrhœa, is another object of great moment. The disease is often wholly arrested by timely assistance at this period. The number of course must depend upon the population and extent of the locality.

Burial of the dead is also a subject of importance. When a person dies of Cholera, the disease may always be considered as having become contagious. The body should therefore be wrapped up in a tarpaulin, sear cloth, or painted canvass, and put in a coffin pitched inside on the seams, and screwed down. The sooner interment takes place the better. It ought to be within 12 hours.

The bedding and clothes of the person, if valueless, ought to be immediately burned. If of greater value, they should be put into a copper of boiling water, and well boiled for two hours. Such articles as cannot undergo boiling, should be baked. There is no danger of infection after the adoption of these means of purification. Bedsteads, tables, and such articles of furniture, may be exposed to the open air for a day or two, and then they are harmless.

Ventilation is of the highest importance in every stage of the disease; and, therefore, no means of thorough ventilation should be omitted.—Cleanliness, too, is equally essential, and when practicable, the wards should be frequently emptied and washed.

The dwellings of the patients, who are attended at their own houses, should be well lime-washed and cleaned.

LOCAL BOARDS OF HEALTH.—The first object of a Board of Health should be to gain the confidence of the people. On their first establish-

ment, no circumstance should be too trifling for their notice, and they should give due publicity to all their acts and measures. Nothing does so much injury as mystery, or even the appearance of it. The Board of Health here, place in a conspicuous part of the town, a copy of the Daily Report to the Central Board. Thus, all are informed of the real state of affairs, and the exaggerated and unfounded reports which become current, when there is nothing authentic, are either wholly suppressed, or rendered completely harmless.

To induce patients to go to the Hospital, their friends should not be prevented visiting them. The regulations as to diet, Hospital Establishment, &c. should be hung up in each ward, for the inspection of the patients and their friends. By adopting this plan, we have found no difficulty in inducing the patients to come into the Hospital; and before the erection of the Marquee, we were compelled to decline taking in cases, that were anxious to avail themselves of Hospital accommodation. Nor is there any objection to permit the friends or relatives to visit the patients. There is far less risk in visiting a Cholera patient in a well ventilated Hospital, than when in the wretched miserable hovels, in which some are compelled to end their days.

CORRIGENDA.

The reader is requested to correct the following with the pen:—

Page 6, line 5, dele “ of.”

— 12, — 7, for “dysentery,” read “diarrhœa.”

— 13, 7th line from bottom, for “or,” read “and.”

— 18, 9th do. from do. for “present,” read “presents.”

— 19, Foot note for “Oshaughnessy,” read “O'Shaughnessy.”

IN SEVERAL OF THE COPIES:—

Page 29, line 3d from bottom, for “instantaneously,” read “in ten instances only.”

— 43, line 8th from bottom, read “and the state of the pupil, the index of the description of morbid vascularity in the brain.”

FINIS.